REMARKS

Applicants appreciate the Examiner's thorough examination of the subject application and request reconsideration of the subject application based on the foregoing amendments and the following remarks.

Claims 2-13, 16, 17, 19-22, 24-34, 36 and 37 are pending in the subject application. The Examiner has acknowledged claims 2-6 as being allowable.

Claims 7-9, 16, 17, 19-22, 24-34, 36 and 37 are rejected under 35 U.S.C. §103.

Claims 10-13 were objected to as depending from a rejected base claim, however, the Examiner indicated that the claims would be allowable if appropriately re-written in independent form. In as much as Applicants believe that the respective base claim for the object to claims is allowable, Applicants did not re-write these claims as had been suggested, however, Applicants reserve the right to enter later one or more independent claims that include the limitation of any one or more of claims 10-13 as well as reserving the right to appropriately re-write any one or more of claims 10-13 in independent form.

Claims 38 - 59 were added to more distinctly claim aspects/ embodiments of Applicants' invention. The amendments to the claims are supported by the originally filed disclosure.

35 U.S.C. §103 REJECTIONS

Claims 7-9, 16, 17, 19-22, 24-34, 36 and 37 stand rejected under 35 U.S.C. §103 as being unpatentable over the cited prior art for the reasons provided on pages 2-13 of the above-referenced

Office Action. The following addresses the specific rejections provided in the above-referenced Office Action.

CLAIMS 7, 19 & 24

Claims 7, 19 and 24 stand rejected as being unpatentable over Yanagi, et al. [USP 6,359,607; "Yanagi"] in view of Hirai, et al. [USP 5,874,933; "Hirai"] for the reasons provided on pages 2-4 of the above referenced Office Action. Applicants respectfully traverse.

As grounds for the rejection of claim 7, the above-referenced Office Action asserts that Yanagi discloses a method as set forth in claim 7 and/ or a related display except that Yanagi fails to teach displaying by pulse width modulation. It is further asserted that Hirai discloses that the pulse width modulation technique is well known and thus, that it would have been obvious to one skilled in the art to modify the method of Yanagi based on the teachings of Hirai so as to yield a display with many gradation levels.

Applicants claim, claim 7, a method for driving an image display device; where such a method includes applying a voltage between a potential of signal lines and a potential of a common electrode when a potential of scanning lines is ON, and displaying tones by modulating a pulse width of a two-value voltage supplied to the signal lines. More particularly, such a method includes displaying tones by shifting phases of waveforms of the signal lines and the scanning lines, and polarities of pixels in a signal line direction are inverted alternately. Applicants would also suggest

referring to the discussion in the subject application regarding the second embodiment for further details of the foregoing claimed features.

It first should be noted that figure 12 and the discussion related thereto in Yanagi does not specifically relate to a description of the technique embodied in the prior art display for generating gray-scales. Rather figure 12 illustrates the sequence of signals relating to the display of image signal data. Namely that when Vgh is applied from the scanning line drive circuit to the gate of the TFT of one display pixel, the TFT attains an ON state and the image signal Vsp voltage from the signal line driving circuit is applied to the pixel through the source and drain of the TFT. It is further described that until a scanning voltage Vgh is applied for the next file (TF2), the pixel electrode maintains the pixel potential. This disclosure in Yanagi in now way describes, a methodology wherein tones or the gray scales to be displayed result from shifting phases of waveforms of the signal lines and the scanning lines. It also can hardly be said that this description suggest, teaches or offers any motivation for such a methodology. Moreover, it can be hardly said that one skilled in the art would have been apprised of displaying tones in the manner set forth in the claims based on the disclosure in Yanagi on how the image signal voltage is applied to the pixel electrode and how the pixel electrode is switched.

In addition, the phase of the common electrode in the present invention is constant with respect to the scanning signal, and the pulse width modulation driving is carried out while performing the one horizontal period inversion driving or dot inversion driving. Therefore, when the potential of scanning lines is ON, the liquid crystal capacitance of the pixel is charged or

discharged by switching a potential of the signal lines between high level and low level after an elapsed time period that varies depending on the tone, thereby realizing tone display.

In contrast to the present invention, Figure 12 of Yanagi also is not related to either pulse wide modulation driving nor tone display, and when Vg (which is a potential of a scanning line in each field TF) is ON, Vs (which is a potential of a signal) is held a constant potential. Therefore, Yanagi does not indicate that tone display is realized by shifting the waveform phases of the signal line and the scanning line or the waveform phases of the signal line and the common electrode.

Further, Yanagi merely indicates that a drain currency (ON resistance) of the TFT, depending on a gate voltage, varies upon application of an ON voltage to the gate, in association with the control of slopes of falls of the scanning signal. Yanagi does not indicate that the voltage of the scanning line is decreased from the beginning of one horizontal period and to the end of one horizontal period to enhance the accuracy of time resolution, which is required for the tone expression on the low voltage side, without increasing a voltage of a signal line. See Yanagi col. 7, lines 7-17.

As to Hirai, while Hirai does refer to the pulse width modulation methodology, it is clear from the discussion in the subject application (e.g., see Background discussion) that the conventional pulse-width-modulation technique describes a technique whereby the width of the scanning line signal pulse is controlled or adjusted so as to control the tone or gray scale. Thus, it can hardly be said that a conventional pulse-width-modulation technique discloses, teaches or

suggests the pulse width modulation as claimed by Applicants displaying tones by shifting phases of waveforms of the signal lines and the scanning lines.

Moreover, the assertion as to the use of a pulse-width-modulation modulation technique also is being done without giving consideration to the statements contained in Hirai that teach away from the unbridled use of such a technique in connection with liquid crystal displays. As indicated in the discussion in columns 2 and 3 of Hirai, it is difficult to use the pulse-width-modulation technique to display multi-gradation pictures on liquid crystal display units of a simple matrix type (see *e.g.*, Hirai col. 2, lines 11-16). More specifically, since it is difficult to use the PHM (phase modulation) or PWM (pulse width modulation) method in order to display a multi-gradation picture on a liquid crystal display unit of simple matrix type, a driving method different from the PWM method, etc. is adopted as described in column 4, lines 23-32 of Hirai.

Thus, not only does Hirai not teach that pulse width modulation is adopted for tone display, Hirai also teaches away from the use of the so-called well known pulse-width modulation technique.

In sum, neither Yanagi nor Hirai provide any discussion, teaching or suggestion of a methodology for driving an image display device that embodies the pulse width modulation technique for displaying the tones and which further includes displaying the tones by shifting phases of waveforms of the signal lines and the scanning lines. Also, there is no teaching suggestion, or motivation offered in either of the two cited references for modifying the methodology and/ or image display device disclosed in Yanagi so as to yield such a method.

Moreover, there is no teaching or suggestion offered in either of the cited references that if the methodology and/ or image display device of Yanagi was so modified it would be reasonably successful.

Applicants respectfully submit that the foregoing reasons distinguishing the methodology of claim 7 also applies to distinguish the driving device of claim 19 and the image display device of claim 24.

It is respectfully submitted that claims 7, 19 and 24 are patentable over the cited reference(s) for the foregoing reasons.

CLAIMS 8, 9, 20, 21, 25 & 26

Claims 8-9, 20-21, 25 and 26 stand rejected as being unpatentable over Inoue et al [USP 6,504,521; "Inoue"] in view of Hirai, et al. [USP 5,874,933; "Hirai"] and Ino et al. [USP 6,424,521; "Ino"] for the reasons provided on pages 4-7 of the above referenced Office Action.

As grounds for the rejection, the above-referenced Office Action provides that Inoue discloses a method for driving an image display device substantially as set forth in claim 8 but does not teach displaying by pulse width modulation. It is further asserted that Hirai discloses that the pulse width modulation technique is well known, and thus, that it would have been obvious to one skilled in the art to modify the method of Yanagi based on the teachings of Hirai so as to yield a display with many gradation levels. It is further admitted that the combination of Yanagi and Hirari fails to teach polarity inversion, but that such a teaching is found in Ino. The Office Action thus

concludes that it would have been obvious to one skilled in the art to modify the method/ display of Inoue as taught by Hirai and Ino so as to yield the method of claim 8. Applicants respectfully traverse.

Applicants claim, claim 8, a method for driving an image display device, where in the method a voltage is applied between a potential of signal lines and a potential of a common electrode when a potential of scanning lines is ON, and displaying tones by modulating a pulse width of a two-value voltage supplied to the signal lines. Such a method further includes displaying the tones by shifting phases of waveforms of the signal lines and the common electrode, and polarities of pixels in a signal line direction are inverted alternately.

The Office Action asserts that Inoue teaches displaying tones by modulating a pulse width but also elsewhere admits that Inoue fails to teach displaying by pulse width modulation. In any event, it is clear from the discussion in col. 2, line 22 through col. 3, line 28 of Inoue, that the method for displaying tones does not involve pulse width modulation. Rather it is clear from this discussion that the technique embodied in the method and device described in Inoue for displaying tones, is the technique where the image signal voltage being outputted to signal lines is controlled so as to be one of a plurality of "gray-scale" voltages, which one voltage serves as the signal line drive voltage. This clearly is not a pulse-width modulation technique.

It is clear rather from the discussion in Inoue (see column 2, line 22 to column 3, line 28, and Figures 13 and 14 thereof), that the display device in Inoue embodies and is directed to the voltage variation driving technique, not to the pulse width modulation technique. In addition, in

Inoue, tone display is not realized by shifting the waveform phases of the signal line and the common electrode; when Vg (which is a voltage of a scanning line) is ON in Figure 17, the signal line drive voltage b (V0) is held constant.

It also should be noted that, Inoue does not vary the amplitude of a voltage supplied to the scanning lines between positive application and negative application in the pulse width modulation technique. Although the Office Action indicates that the amplitude of a voltage supplied to the scanning lines is varied in Figure 16, Inoue merely discloses that a pulse width of the voltage of the scanning line varies depending on whether the voltage of the scanning line is at high level or low level. This does not indicate, teach not suggest that the amplitude (*i.e.*, height of a pulse) of the voltage supplied to the scanning lines is varied between positive application and negative application, as is described in page 65, line 17 to page 66, line 1, and Figures 39-41 of the subject application.

Applicants thus submit that no motivation has been offered as to why one skilled in the art, would have been motivated to use a different technique for controlling the display tones from that disclosed and taught in Inoue. Such a suggestion or teaching to modify also appears unlikely, where as indicated above, Hirai offers no motivation for such a modification, teaches away from using the pulse width modulation technique and also contains no indication that such a modification would yield a method or device that would be reasonably successful.

Moreover, and as indicated in the discussion above regarding claims 7, 19 and 24, while Hirai does refer to the pulse width modulation methodology, it is clear from the discussion in the

subject application (*e.g.*, see Background discussion) that the conventional pulse-width-modulation technique describes a technique whereby the width of the scanning line signal pulse is controlled or adjusted so as to control the tone or gray scale of the image signal to be displayed. Thus, it can hardly be said that a conventional pulse-width-modulation technique of Hirai discloses, teaches or suggests displaying tones by shifting phases of waveforms of the signal lines and the scanning lines. As further indicated above, Hirai also teaches away from the use of the so-called well known pulse-width modulation technique, more specifically, Hirai teaches that since it is difficult to use the PHM (phase modulation) or PWM (pulse width modulation) method in order to display a multi-gradation picture on a liquid crystal display unit of simple matrix type, a driving method different from the PWM method, is adopted in the invention being described in Hirai.

As indicated above and in the Office Action, the tertiary reference Ino is being used for the limited purposes, namely allegedly teaching polarity inversion. It thus is submitted that Ino does not provide the teachings, suggestions or discussion needed to overcome the above-noted shortcomings or limitations regarding the combination of Inoue and Hirai. Applicants, however, offer the following observations as to what is being taught/ disclosed in Ino.

Ino merely performs dot-inversion driving method to reduce flickers in a liquid crystal display device (see column 1, lines 20-38 thereof). Ino, unlike the present invention, does not realize excellent multi-tone displays by holding a constant phase of the common electrode with respect to the scanning signal and carrying out the pulse width modulation driving while performing the one horizontal period inversion driving or dot inversion driving. Still further, Ino, as with

Yanagi, does not teach that when the potential of scanning lines is ON, tone display is realized by switching a potential of the signal lines between high level and low level after an elapsed time period which varies depending on the tone.

In sum, Yanagi, Hirai and Ino, alone or in combination do *not* provide any discussion, teaching or suggestion of a methodology for driving an image display device that embodies the pulse width modulation technique for displaying the tones and which further includes displaying the tones by shifting phases of waveforms of the signal lines and the scanning lines. Also, there is no teaching suggestion, or motivation offered in any of these cited references for modifying the methodology disclosed in Inoue so as to yield such a method. Moreover, there is no teaching or suggestion offered in any of these cited references that if the methodology of Inoue were modified so as to yield the invention of claim 8, such a method would be reasonably successful.

Applicants respectfully submit that at least for the foregoing reasons that distinguish the methodology of claim 8 from the combination of references; the method of claim 9, the driving device of either of claims 20 and 21, and/ or the image display device of either of claims 25 and 26, are each distinguishable from the identified combination of references.

It is respectfully submitted that claims 8-9, 20-21, 25 and 26 are patentable over the cited reference(s) for the foregoing reasons.

CLAIMS 22, 27

Claims 22 and 27 stand rejected as being unpatentable over Inoue et al [USP 6,504,521; "Inoue"] in view of Hirai, et al. [USP 5,874,933; "Hirai"], Ino et al. [USP 6,424,521; "Ino"] and Okada et al. [USP 5,621,426; "Okada"] for the reasons provided on pages 7-8 of the above referenced Office Action. Applicants respectfully traverse.

Applicants claim, claim 22, a driving device of an image display device which includes a plurality of pixel electrodes which are formed on a substrate, pixel switching elements which are individually connected to the pixel electrodes, a plurality of signal lines for applying a data signal according to a display image to the pixel electrodes, and a common electrode for applying a common potential to pixels. Such a driving device applies a voltage between a potential of the signal lines and a potential of the common electrode when a potential of scanning lines is ON, and displays tones by modulating a pulse width of a two-value voltage supplied to the signal lines. Also, such a driving device includes a scanning line driving section for varying an amplitude of a voltage supplied to the scanning lines so that a resistance of a transistor for switching ON or OFF signal application from the signal lines to the pixels is increased with time from a beginning to an end of an application time of a single pixel.

As indicated in the discussion above regarding claims 8-9, 20-21, 25 and 26 the combination of Inoue and Hirai and the combination of Inoue, Hirai and Ino does *not* provide any discussion, teaching or suggestion of a methodology for driving an image display device that embodies the pulse width modulation technique for displaying the tones and that there also is no

teaching suggestion, or motivation offered in any of these cited references for modifying the methodology disclosed in Inoue so as to yield such a method. Moreover, there is no teaching or suggestion offered in any of these cited references that if the device/ methodology of Inoue was modified so as to yield the driving device of claim 22, such a driving device would be reasonably successful.

The above-referenced Office Action admits that Inoue (and thus apparently the combination of Inoue, Hirai and Ino) does not teach resistance of transistor. The Office Action further asserts that Okada teaches TFT 95 as a switching means and that the resistance is increased in time from zero to a large value (i.e., 10^6 ohms). The Office Action also further asserts that it would have been obvious to use the apparatus of Inoue as modified by the teachings of Hirai and Ino as well as increasing the resistance of the switch as taught by Okada. Applicants respectfully disagree with the characterization of what is being disclosed and taught in Okada.

As to the discussion in Okada identified in the Office Action, it should first be noted that the discussion does not refer to or claim to be the characteristics of the switching elements 95 (TFTs) of the display, but rather the discussion and related figure is specifically described as being for the analog switches 124-127, which as shown in figure 11 of Okada are switches of the data driver. Thus, it can hardly be said that the discussion and related figures teach or suggest design considerations of the scanning line drive section of claim 22.

Further, figure 16 in Okada as well as the related discussion also does not suggest, teach or disclose a scanning line driving section for varying an amplitude of a voltage supplied to the

scanning lines so that a resistance of a transistor for switching ON or OFF signal application from the signal lines to the pixels is increased with time from a beginning to an end of an application time of a single pixel. Rather figure 16 of Okada merely describes the operational characteristics of the analog switch when it is operated to be turned OFF and ON. The period of time illustrated on the figure relates to the period of time taken by the switch to go from the ON state to the OFF state (i.e., T1) and the OFF state to the ON state (i.e., T2) after the switch has received a signal to be turned ON or OFF. The illustrated time period in no way describes or relates to a time period corresponding to the time from the beginning to the end of the application of a voltage supplied to the scanning line to a single pixel of the display.

In addition, figure 16 of Okada, as indicated in the Office Action describes that a resistance of an analog switch increases with time in a period T_1, which is a period during which the analog switch changes from the ON-state to the Off-state. However, the above description merely indicates switching characteristics of an analog switch relative to a control signal c_i, and does not indicate that an amplitude of a voltage supplied to the scanning lines is varied so that the resistance of a transistor for switching ON or OFF signal application from the signal lines to the pixels is increased with time from the beginning to the end of the application time on a single pixel.

Furthermore, the teachings referred to in Okada in any event do not describe, teach or disclose the operational characteristics of a scanning line driving section. The discussion referred to in Okada does not teach or suggest configuring a driving section so that during a time period defined as being from the beginning to an end of the application time for a single pixel, the

amplitude of a voltage being supplied to the scanning lines is varied so as to cause the resistance of the transistor to be increased. Moreover, what the figure in Okada does illustrate; is that when the analog switch receives a signal to turn OFF, the resistance of the switch increases and that when the switch is turned ON, the resistance decreases. Such teachings are inherently inconsistent with the operational characteristics of the scanning driving line section of claim 22, because in the claim the time period extends from the beginning to the end of the application period, whereas what figure 16 in Okada describes is what happens to the switch at the very beginning when the analog switch 124-127 in Okada is turned on (*i.e.*, switch resistance decreases) and at the very end when the analog switch is turned OFF (*i.e.*, switch resistance increases), the figure does not illustrates what happens therebetween.

Applicants also would direct the Examiner's attention to the discussion at pages 60-63 of the subject application that more particularly describes this aspect of the present invention. Applicants also would note that such a discussion does not appear in Okada nor does such a discussion in any of the other cited references. As such, it can hardly be said that Okada or the other cited references discloses such a scanning line driving section and the configuration thereof as is set forth in claim 22.

In sum, the cited combination of references, and more specifically Okada, does not anywhere disclose, teach or suggest a driving device of an image display device which includes *inter alia* a scanning line driving section for varying an amplitude of a voltage supplied to the scanning lines so that a resistance of a transistor for switching ON or OFF signal application from

the signal lines to the pixels is increased with time from a beginning to an end of an application time of a single pixel. Applicants also respectfully submit that there is no teaching suggestion, or motivation offered in any of these cited references, including Okada for modifying the driving circuit disclosed in Inoue so as to yield the driving circuit of claim 22. Moreover, there is no teaching or suggestion offered in any of these cited references that if the driving device/ methodology of Inoue was modified so as to yield the driving device f claim 22, such a driving device would be reasonably successful.

Applicants respectfully submit that at least the foregoing reasons distinguishing the driving device of claim 22 from the cited combination of references also applies to distinguish the image display device of claim 27 from the identified combination of references.

It is respectfully submitted that claims 22 and 27 are patentable over the cited reference(s) for the foregoing reasons.

CLAIM 16

Claim 16 stands rejected as being unpatentable over Hirai, et al. [USP 5,874,933; "Hirai"] in view of and Okada et al. [USP 5,621,426; "Okada"] for the reasons provided on pages 8-9 of the above referenced Office Action. Applicants respectfully traverse.

Applicants claim, claim 16, a method for driving an image display device, such a method displaying tones by modulating a pulse width of a two-value voltage supplied to signal lines. Such a method further includes having a resistance of a transistor which switches ON or OFF signal

application from the signal lines to pixels being increased with time from a beginning to an end of an application time of a single pixel, where the application time of the single pixel is 1 horizontal period.

As indicated in the discussion above regarding claims 7, 19 and 24, while Hirai does refer to the pulse width modulation methodology, it is clear from the discussion in the subject application (*e.g.*, see Background discussion) that the conventional pulse-width-modulation technique describes a technique whereby the width of the scanning line signal pulse is controlled or adjusted so as to control the tone or gray scale of the image signal to be displayed. Thus, it can hardly be said that a conventional pulse-width-modulation technique of Hirai discloses, teaches or suggests displaying tones by shifting phases of waveforms of the signal lines and the scanning lines. As further indicated above, Hirai also teaches away from the use of the so-called well known pulse-width modulation technique, more specifically, Hirai teaches that since it is difficult to use the PHM (phase modulation) or PWM (pulse width modulation) method in order to display a multi-gradation picture on a liquid crystal display unit of simple matrix type, a driving method different from the PWM method, is adopted in the invention being described in Hirai.

As indicated in the discussion above regarding claim 22, Okada, does not anywhere disclose, teach or suggest a driving device of an image display device which includes *inter alia* a scanning line driving section for varying an amplitude of a voltage supplied to the scanning lines so that a resistance of a transistor for switching ON or OFF signal application from the signal lines to the pixels is increased with time from a beginning to an end of an application time of a single pixel.

Applicants also respectfully submit that there is no teaching suggestion, or motivation offered in any of these cited references, including Okada for modifying the driving circuit disclosed in Inoue so as to yield such a driving circuit. Moreover, there is no teaching or suggestion offered in any of these cited references that if the driving device/ methodology of Hirai was modified so as to yield the driving device claimed by Applicants, such a driving device would be reasonably successful. As also admitted in the Office Action, Hirai does not include such a teaching or suggestion either. Thus, it can hardly be said that Okada and Hirai discloses, teaches or suggest a methodology for driving an image display device in which, *inter alia*, the resistance of a transistor that switches ON or OFF signal application from the signal lines to pixels is increased with time from beginning to an end of an application time of a single pixel, and more specifically, where the application time of the single pixel is 1 horizontal period.

As such, and at least for the foregoing reasons, Applicants respectfully submit that claim 16 is distinguishable from the cited combination of references.

It is respectfully submitted that claim 16 is patentable over the cited reference(s) for the foregoing reasons.

CLAIM 17

Claim 17 stands rejected as being unpatentable over Hirai, et al. [USP 5,874,933; "Hirai"] in view of and Okada et al. [USP 5,621,426; Ohkada"] and Yanagi, et al. [USP 6,359,607;

"Yanagi"] for the reasons provided on page 9 of the above referenced Office Action. Applicants respectfully traverse.

Claim 17 depends from claim 16, and as indicated in the discussion regarding claim 16, Okada, does not anywhere disclose, teach or suggest a driving device of an image display device which includes *inter alia* a scanning line driving section for varying an amplitude of a voltage supplied to the scanning lines so that a resistance of a transistor for switching ON or OFF signal application from the signal lines to the pixels is increased with time from a beginning to an end of an application time of a single pixel. Applicants also respectfully submit that there is no teaching suggestion, or motivation offered in any of these cited references, including Okada for modifying the driving circuit disclosed in Hirai so as to yield such a driving circuit. Moreover, there is no teaching or suggestion offered in any of these cited references that if the driving device/ methodology of Hirai were modified so as to yield the driving device claimed by Applicants, such a driving device would be reasonably successful. As also admitted in the Office Action, Hirai does not include such a teaching or suggestion either. Thus, it can hardly be said that Okada and Hirai discloses, teaches or suggest a methodology for driving an image display device in which, *inter alia*, the resistance of a transistor that switches ON or OFF signal application from the signal lines to pixels is increased with time from beginning to an end of an application time of a single pixel, and more specifically, where the application time of the single pixel is 1 horizontal period.

As such, at least because of its dependency from a base claim believed to be allowable, claim 17 also is considered to be allowable.

As to claim 17, this claim adds the further limitation that the resistance of the transistor is varied by varying the gate voltage. As Okada and Hirai does not disclose a method in which the resistance of the transistor is increased over the application period to a single pixel, it can hardly be said that Okada and Hirai in combination with Yanagi can teach, suggest or describe such a method.

As such, and at least for the foregoing reasons, Applicants respectfully submit that claim 17 is distinguishable from the cited combination of references.

It is respectfully submitted that claim 17 is patentable over the cited reference(s) for the foregoing reasons.

CLAIMS 28-30, 34, 36 & 37

Claims 28-30, 34, 36 and 37 stand rejected as being unpatentable over Yoshida et al. [USP 6,496,160; "Yoshida"] in view of Sim [USP 6,091,390] for the reasons provided on pages 9-11 of the above referenced Office Action.

The Office Action asserts that Yoshida teaches an activematrix-driven image display device substantially as set forth in the claims, except that for example in the case of claim 28, Yoshida does not describe or teach a step up circuit. The Office Action further asserts that Sim discloses a level shifter and thus concludes that the image display device is yielded by the combination of the teachings of Yoshida and Sim. Applicants respectfully traverse.

Applicants claim, claim 28, an activematrix-driven image display device including an image display panel for displaying an image by switching by a plurality of active elements, a voltage varying circuit and step-up circuit. The voltage varying circuit varies a voltage of a signal for driving the active elements according to temperature change of the image display panel, so as to carry out temperature compensation of the active elements. The step-up circuit steps up a signal voltage for driving the active elements and the signal voltage for driving the active elements is stepped up by the step-up circuit after being varied by the voltage varying circuit.

In contrast to the present invention, Yoshida describes a methodology and driver in which a voltage correction is made to the data signal being outputted by the driver to the signal lines. Yoshida nowhere suggest, describes or teaches varying the voltage of a signal for driving the active elements according to a temperature change of the display panel. Yoshida merely describes how the properties of the liquid crystal material making up the display can vary as the temperature fluctuates. There is no discussion therein as to the temperature dependency of the active elements and how when the active elements are used in a device embodying a pulse width modulation technique, as is done in the subject application.

More particularly, Yoshida describes that temperature correction is applied with respect to a voltage of a signal immediately before it is supplied to an active matrix panel 73 (column 13, line 36 to column 14, line 20). Yoshida *does not* indicate that temperature compensation is applied with respect to a power voltage before it is stepped up, and the voltage thus subjected to temperature compensation is then stepped up and supplied to the panel.

It thus can hardly be said, as is asserted in the Office Action, that Yoshida teaches an activematrix-driven image display device in which the voltage varying circuit varies a voltage of a signal for driving the active elements according to temperature change of the image display panel, so as to carry out temperature compensation of the active elements. As to the secondary reference, Sim is being referred to for a limited purpose; thus, Applicants respectfully submit that claim 28 is distinguishable from the cited combination of references. Applicants, however, provide the following observations as to the secondary reference, Sim.

Sim merely describes that a level shifter 44 compensates for the level difference between digital comparator 43 and DAC 42 (see col. 3, lines 10-22 thereof). Sim *does not* disclose and indicate temperature compensation of active elements, and which of the temperature compensation and the voltage step-up is first processed.

Applicants respectfully submit that at least the foregoing reasons distinguishing the activematrix-driven image display of claim 22 from the cited combination of references also applies to distinguish the image display device of claims 29-30, 34; the driving device of an activematrix-driven image display device of claim 36 and the driving method of an activematrix-driven image display device of claim 37, from the identified combination of references.

It is respectfully submitted that claims 28-30, 34, 36 and 37 are patentable over the cited reference(s) for the foregoing reasons.

CLAIM 31

Claim 31 stands rejected as being unpatentable over Yoshida et al. [USP 6,496,160; "Yoshida"] in view of Sim [USP 6,091,390] and further in view of Hirai, et al. [USP 5,874,933; "Hirai"] for the reasons provided on pages 11-12 of the above referenced Office Action.

Claim 31 depends from claim 28, which claim as indicated above is considered to be allowable over the combination of Yoshida and Sim. Thus, and at least because of its dependency from a base claim believed to be allowable, claim 31 also is considered to be allowable.

As to Hirai, this reference is being cited for the limited purpose of teaching that pulse-width modulation is a well known technique. However, and as indicated in the discussion above regarding claims 7, 19 and 24, while Hirai does refer to the pulse width modulation methodology, it is clear from the discussion in the subject application (*e.g.*, see Background discussion) that the conventional pulse-width-modulation technique describes a technique whereby the width of the scanning line signal pulse is controlled or adjusted so as to control the tone or gray scale of the image signal to be displayed. Thus, it can hardly be said that a conventional pulse-width-modulation technique of Hirai discloses, teaches or suggests displaying tones by shifting phases of waveforms of the signal lines and the scanning lines. As further indicated above, Hirai also teaches away from the use of the so-called well known pulse-width modulation technique, more specifically, Hirai teaches that since it is difficult to use the PHM (phase modulation) or PWM (pulse width modulation) method in order to display a multi-gradation picture on a liquid crystal

display unit of simple matrix type, a driving method different from the PWM method, is adopted in the invention being described in Hirai.

As such claim 31 is further distinguishable from the cited combination of Yoshida, Sim and Hirai.

It is respectfully submitted that claim 31 is patentable over the cited reference(s) for the foregoing reasons.

CLAIM 32

Claim 32 stands rejected as being unpatentable over Yoshida et al. [USP 6,496,160; "Yoshida"] in view of Sim [USP 6,091,390] and further in view of Mizutome et al. [USP 6,037,920; "Mizutome"] for the reasons provided on page 12 of the above referenced Office Action.

Claim 32 depends from claim 28, which claim as indicated above is considered to be allowable over the combination of Yoshida and Sim. Thus, and at least because of its dependency from a base claim believed to be allowable, claim 32 also is considered to be allowable.

As to Mizutome, this reference as with Yoshida, describes a process for dealing with the changing properties of the liquid crystal material of the liquid crystal display due to temperature fluctuations and thus can hardly be said to disclose an image display device in which the scanning signal is varied according to temperature change of the display panel. More specifically, Mizutome indicates that the temperature compensation of a liquid crystal panel 101 is performed by switching

a drive voltage between 20V and 15V, depending on whether the temperature of the liquid crystal panel 101 is within a range of 0-30°C or higher than 30°C (see col. 4, lines 17-37 thereof). Mizutome, unlike the present invention, does not disclose that temperature compensation of active elements is performed depending on a change in temperature of an image display panel. As such claim 32 is further distinguishable from the cited combination of Yoshida, Sim and Mizutome.

It is respectfully submitted that claim 32 is patentable over the cited reference(s) for the foregoing reasons.

CLAIM 33

Claim 33 stands rejected as being unpatentable over Yoshida et al. [USP 6,496,160; "Yoshida"] in view of Sim [USP 6,091,390] and further in view of Wood et al. [USP 5,926,162; "Wood"] for the reasons provided on page 12 - 13 of the above referenced Office Action.

Claim 33 depends from claim 28, which claim as indicated above is considered to be allowable over the combination of Yoshida and Sim. Thus, and at least because of its dependency from a base claim believed to be allowable, claim 33 also is considered to be allowable.

As to Wood, this reference as with Yoshida, describes a process for dealing with the changing properties of the liquid crystal material of the liquid crystal display due to temperature fluctuations and thus can hardly be said to disclose an image display device in which the scanning signal is varied according to temperature change of the display panel (e.g., see col. 2, lines 55-58 of Wood). More specifically, Wood indicates that a voltage applied to a common electrode 114 is

adjusted so that the common electrode voltage is the average of the maximum and minimum source drive signals Sn, so as to compensate for the variations in the common electrode 114 voltage (see col. 9, lines 42-45, lines 53-58 thereof). Wood, unlike the present invention, does not disclose that temperature compensation of active elements is performed depending on a change in temperature of an image display panel, so as to constantly supply a constant current flow to a drain electrode. As such claim 33 is further distinguishable from the cited combination of Yoshida, Sim and Mizutome.

It is respectfully submitted that claim 33 is patentable over the cited reference(s) for the foregoing reasons.

The following additional remarks shall apply to each of the above.

As provided in MPEP 2143.01, obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. *In re Fine*, 837 F. 2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); *In re Jones*, 958 F. 2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). As provided above, the references cited, alone or in combination, include no such teaching, suggestion or motivation.

Furthermore, and as provided in MPEP 2143.02, a prior art reference can be combined or modified to reject claims as obvious as long as there is a reasonable expectation of success. *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 19866). Additionally, it also has been

held that if the proposed modification or combination would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. Further, and as provided in MPEP-2143, the teaching or suggestion to make the claimed combination and the reasonable suggestion of success must both be found in the prior art, not in applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). As can be seen from the forgoing discussion regarding the disclosures of the cited references, there is no reasonable expectation of success provided in the references. Also, it is clear from the foregoing discussion that the modification suggested by the Examiner would change the principle of operation of the device and methodology disclosed in the respective primary reference.

As provided in MPEP-2145 (XD) a prior art reference that "teaches away" from the claimed invention is significant factor to be considered in determining obviousness. It also is provided therein that the totality of the prior art must be considered, and proceeding contrary to accepted wisdom in the art is evidence of non-obviousness. *In re Hedges*, 783 F.2d 1038, 228 USPQ 685 (Fed. Cir. 1986).

The Federal Circuit also has indicated that a prior art reference that gives only general guidance and is not all that specific as to particular forms of a claimed invention and how to achieve it, may make a certain approach obvious to try, but does not make the invention obvious. *Ex Parte Obukowicz*, 27 USPQ2d 1063, citing *In re O'Farrell*, 853 F.2d 894, 7 USPQ2d 1673,1681 (Fed. Cir. 1988).

As the Federal circuit has stated, "[t]he mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification." *In re Fritch*, 972 F.2d 1260,1266, 23 USPQ2d 1780, 1783-84 (Fed. Cir. 1992). Obviousness may not be established using hindsight or in view of the teachings or suggestions of the inventor. *Para-Ordance Mfg. v. SGS Importers Int'l, Inc.*, 73 F.2d 1085, 1087, 37 USPQ2d 1237, 1239 (Fed. Cir. 1995).

It is respectfully submitted that for the foregoing reasons, claims 7-9, 16, 17, 19-22, 24-34, 36 and 37 are patentable over the cited reference(s) and, therefore, satisfy the requirements of 35 U.S.C. §103. As such, these claims are allowable.

CLAIMS 10-13

In the above-referenced Office Action, claims 10-13 were objected to as being dependent upon a rejected base claim. It also was provided in the above-referenced Office Action, however, that these claims would be allowable if rewritten in independent form to include all the limitations of the base claim and any intervening claim(s).

In as much as Applicants believe that the respective base claim for each of claims 10-13 is in allowable form, claims 10-13 were not re-written in independent form as suggested by the Examiner. Applicants, however, reserve the right to later amend the subject application so as to present any one or more of these claims in independent form or to add one or more independent claims that contain the limitations of any one or more of claims 10-13.

CLAIMS 38 - 59

As indicated above, claims 38 - 59 were added to more distinctly claim embodiments/ aspects of the present invention. These claims are clearly supported by the originally filed disclosure, including the originally filed claims.

In particular, reference should be made to page 54, line 1 to page 59, line 19; page 79, line 7 to page 80, line 10; and Figures 24 and 25 of the subject application for new claim 38; reference should be made to page 54, line 1 to page 59, line 19; page 79, line 7 to page 80, line 10; and Figures 24 and 25 for new claim 39; reference should be made to page 54, line 1 to page 59, line 19; page 79, line 7 to page 80, line 10; and Figures 24 and 25 for new claims 40 and 41; reference should be made to page 54, line 1 to page 59, line 19; page 79, line 7 to page 80, line 10; and Figures 24 and 25 for new claims 42 and 43; reference should be made to page 65, line 17 to page 66, line 1; and Figures 39-41 for new claims 44 and 45; reference should be made to page 65, line 17 to page 66, line 1; and Figures 39-41 for new claims 46 and 47; reference should be made to page 60, lines 4-12; and Figures 33 and 41 for new claims 48 and 49; reference should be made to page 65, line 17 to page 66, line 1; page 60, lines 4-12; and Figure 41 for new claims 50-51; reference should be made to page 60, lines 4-12; and Figures 33 and 41 for new claim 52; reference should be made to page 65, line 17 to page 66, line 1; page 60, lines 4-12; and Figure 41 for new claim 53; reference should be made to page 105, line 21 to page 108, line 4 for new claim 54; reference should be made to page 108, line 20 to page 108, line 9 for new claim 55; reference

should be made to page 111, line 4 to page 112, line 19 for new claim 56; reference should be made to page 105, line 21 to page 108, line 4 for new claim 57; reference should be made to page 108, line 20 to page 108, line 9 for new claim 58; and reference should be made to page 111, line 4 to page 112, line 19 for new claim 59.

It also is respectfully submitted that these added claims are patentable over the cited prior art on which the above-described rejection(s) are based.

It is respectfully submitted that the subject application is in a condition for allowance. Early and favorable action is requested.

Because the total number of claims and/or the total number of independent claims post amendment now exceed the highest number previously paid for, a check is enclosed herewith for the required additional fees. However, if for any reason a fee is required, a fee paid is inadequate or credit is owed for any excess fee paid, the Commissioner is hereby authorized and requested to charge Deposit Account No. **04-1105**.

Respectfully submitted,
Edwards & Angell, LLP

Date: March 30, 2004

By: William J. Daley

William J. Daley, Jr.
(Reg. No. 35,487)
P.O. Box 55874
Boston, MA 02205
(617) 439- 4444

Customer No. 21,874
Bos2_439349.1